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ABSTRACT

The purpose of this paper is to present an ethnographic study (Cardoso, 1999) involving six primary school pupils and doing simple experiments with everyday home equipment in the context of learning science. The hands-on science activities were carried out by children with the help of their parents. Results showed that children learnt at home and that home-background factors influenced children's educational development. Parents preferred practical aspects of science to theoretical. This was reflected in their comments about their own science learning at school, when they compared it with their children's. Data about home activities, such as cooking, indicated that all children had already helped their parents. Cooking also provided us with several good practices of experimentation, as did weighing, floating or sinking and making cheese. We conclude that carrying out simple experiments at home spreads public understanding of Science via parents and also improves the science learning of children. One reason that may explain both conclusions is that the family environment was embedded in experiences that respected the children's own values and social identity (home culture). (Contains 10 references.) (Author/YDS)

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Home Technology and Children's Science Education

by
Ludes Cardoso

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HOME TECHNOLOGY AND CHILDREN'SCIENCE EDUCATION

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Abstract

The purpose of this paper is to present an ethnographic study (Cardoso, 1999) involving six primary school pupils and doing simple experiments with everyday home equipment in the context of learning science.

The hands-on science activities were carried out by children with the help of their parents. Results showed that children learnt at home and that home-background factors influenced children's educational development.

Parents preferred practical aspects of science to theoretical. This was reflected in their comments about their own science learning at school, when they compared it with their children's. Data about home activities, such as cooking, indicated that all children had already helped their parents. Cooking also provided us with several good practices of experimentation, as did weighing, floating or sinking and making cheese. We conclude that carrying out simple experiments at home spreads public understanding of Science via parents and also improves the science learning of children. One reason that may explain both conclusions is that the family environment was embedded in experiences that respected the children's own values and social identity (home culture).

1. Introduction

This paper reflects on the results of the ethnographic study (Cardoso,1999), in which the main purpose of this research was to study six Portuguese families who carried out hands-on activities with their children at home. These activities, related to the Portuguese National Curriculum, were implemented twice a term throughout the school year and based on the methodology in the participant observation.

Thus, the data collection involved *simple science experiments* for primary school children to do with their parents and/or other family members at home. One of the children's activity was called *Science in the kitchen* and all that was necessary was: 1 potato, 1 apple and 1 basin with water.

The activity sheet (SHIPS Project, 1992) gives instructions for *feeling* the weight of the apple and the potato in the children's hands, for *thinking* which one floats and for *observing* both of them in the water.

The activity is divided into three parts. The first involves a whole apple and potato and the second small pieces of apple and potato. Because the children tend to say that *heavy things sink and light things float*, in this activity they find out that pieces of different sizes of apple always float while potato pieces always sink. The third part helps them to see what can be done when a *silly cook* mixes the pieces of apple and potato. He should use the bowl of water to separate them because all the apple pieces float and all the potato pieces sink. So children make this suggestion for themselves.

As we, know, things which float in water have a greater *density* than water, but this is a very difficult idea for children. Thus, the conclusion is that, for their size, potatoes are heavier than water and, for their size, apples are lighter than water.

After a week, the children's work was brought back to the school for discussion with the teacher and the class.

Essentially, the results showed that a simple hands-on activity could be carried out successfully in the home by the children with their parents' helping. The children learnt from the activity, whether or not their parents were knowledgeable about science.

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Also, the *home culture context* was considered as the more important aspect in this study, rather than the gender and the social class comparison. So, from the study data, we see that there is variation between the parents attitudes and it may suggest that in each home their members produce their own culture. For instance, in Jane's home, the hands-on activities suggest some aspects of the family religious life when it is said that the silver bracelets are from her baptism and her father is not present because of the father's religious activities. In Phil's home there are small wood toys made by his grand-father and father who are carpenters. In contrast, in Mick's home there are many mechanical toys, such as boats and he said that the family goes sailing on the weekends. But it is different in Alex's home, in which the country situations of killing a pig and playing mandoline like his uncle, are family activities. In Bob's home there is another kind of conversation, namely about the steam during the bath or the drops of water inside the window in winter because his mother is a teacher. Finally, in the Neil's home, the child shows great initiative and responsability for what is happening during the hands-on activities. He also is quite independent, such as his mother who obtained her independence too early because her parents lived in a small village without school and she went out to study early. So that, in her opinion you do not need to get help in order to have confidence in own ability because it makes it easier for survive.

Home can be considered the socio-cultural world of each family, in which the child-parent interactions, the roles, strategies and attitudes, as well as the kind of the materials used in the course of the hands-on activities by the children and parents are expressions of their social identities. These aspects of the family life can be a new way of interpreting why the six case-study families vary according to the concept of the home-culture.

2. A brief historical view of science education in Portugal

We describe the development of the Portuguese Education System with regard to science education in primary school, in order to understand the teachers', parents' and children's attitudes to science, i.e whether their schooling is related to their attitudes to science teaching in the early years.

The 1960s there were difficult times because an authoritarian regime was in place and political centralization in the country resulted in centralization of the Portuguese educational system. Some papers have been written about the Salazarist primary school, in which *the school tried to train children rather than to educate them.* Of course, in such closed system there is not much educational development.

In the 1970s, the system was expected to contribute to economic growth. In this context, Marcelo Caetano, the head of government from 1968 until the 1974 democratic revolution of 25 April, introduced some reforms, for instance, an important educational reform by the Minister of Education, Law nº 5/73, known as the Veiga Simão Reform, in which would be increased the period of compulsory school from six to eight years. He writes (1972): *Our first concern is rural and industrial environments, where every encouragement should be given to the institution of kindergartens, in close collaboration with other Ministries and private bodies".* About the system of training of teachers he writes (op. cit: 110): *on the one hand we are setting up Higher Teacher Training Schools and, on the other, we are making it possible for (graduates) to enter Education departments in the universities, (directed) by the National Institute of Pedagogy.* Such a system obviously had repercussions on the teaching of science, which had been neglected.

The lack of scientific education in Teacher Training Colleges, as well as in compulsory schooling may have affected the teachers' and parents' attitudes in the context of parents helping their children to learn science at home. In compulsory education, the science curriculum consisted mainly of the study of living things and at secondary school the teaching/ learning of science was a body of established knowledge, in which sciences were taught almost entirely by mechanical rote-learning of facts. However, in this study the practical work plays a central part, in which the activities are carried out with simple everyday equipment. The practice depends on the particular circumstances created by what the parents and children do during the hands-on activities.

With the 1974 revolution, changes in curricula, new forms of pedagogy and school organization - either to aid the building of a socialist society or to create the *socialist school* - were made in the 1976 Portuguese Constitution, both the extension of the Veiga Simão Reform and the attempts at new forms of socialist education were

suggested. By 1978 programme (ME, 1978) a new direction in scientific method and the subjects *Man and Nature, Man and Society* were introduced, at the primary level.

In the 1980 Programme (ME, 1980), there is an important note about the importance of other areas besides *writing* and *mathematics*, such as social and natural sciences (but Biology and Ecology only).

In 1980, the first centenary of Faria de Vasconcelos' birthday is commemorated in Castelo Branco (his birthplace and the location of the present study), and he is considered the man who planned education for the future. He refers to the relevance of studying all the sciences in primary school, to the children's understanding of everyday life and their own development as future citizens. However, his educational contribution as an agent of change and innovation was not realised because the political situation was still unfavourable to its implementation. Only in the 1990 Programme (ME, 1990) was physics introduced. We can see the connection between systems of schooling and the wider society; it is necessary to educate for the jobs which require scientific expertise and technical and technological know-how.

Thus, we might point to the instability of the Portuguese Educational System and the very recent liberalisation of science education in Portugal, especially with regard to science teaching in primary schools. As a result, Portuguese teachers are insecure in science teaching, because they had no training in science before the 1990s. However, children have to learn science in primary school now. So, the following questions arose:

- How can hands-on activities carried out at home by children with the help of their parents make a favourable contribution to the development of science education in primary school ?
- How does the child learn at home and at school ?

In 1986, a ratification of the Basic Law of the Educational System was made by the Parliament and a new educational reform cycle began, apparently with a view to decentralisation and autonomy, in which is introduced curricular components of the regional and local type such as the 'Area School', where parents could participate.

According to the Portuguese Education Act (1986), some objectives of basic education are involving families, a conscious and responsible involvement in their surroundings (Article 7h), and participation in the process of educational information and guidance in collaboration with the family (Article 7m). However, Portugal has not yet developed systems of involving parents in their children's learning, similar to the projects on parental partnership in the UK and USA.

Also, some Portuguese teachers still believe that parental involvement contributes to widening the already existing gap between less and more favoured groups, i. e that the most powerful groups have superior capacity of organization and pressure as well as greater ease in profiting from the direct contact with schools in order to improve their children's learning. These problems must be carefully analysed before any programme of home/school partnership is designed. It raises some questions:

- How do school and family partnerships make sense with a view to benefiting children's learning, development and success in school?
- What new strategies are required for the school to work with families?

3. Reflection on the research results

This reflection is a further understanding of the contexts that parents and children create when they carry out hands-on activities at home.

3.1. The parents respect children's individual differences

The study findings show that the children's opinions, ideas, rhythm and willingness are considered by the parents. Also, the interaction between the child and the parent at home is usually one-to-one, as well as the child's and the parents' roles being reversed; the children often take an organising role.

Thus, the parent-child interactions at home can be considered as a particular way of the parents respect the children's individual differences. The parents treat children differently from how teachers treat them, in which the parents can give more individual attention and have a more intimate relationship with the child than the teacher.

Of course, the opportunities for individual attention are much greater at home than in school where the teacher has to share his/her attention with a greater number of different children. From a sociological and an educational perspective, the teacher should not treat all children the same. Some children are able to exploit home opportunities better than school ones. This was especially evident in the case of Mick, who is not well adjusted to school. If the clash between power relations at school and at home can exert *symbolic violence* (Bourdieu and Passeron, 1977) on the child, the home learning situation is able to remedy this. So the education system needs to recognise the value of working in partnership with parents. Schools should provide a constructive communication between teachers and parents, because learning from one-to-one (home) and in large groups (school) can be important contributions to the children's education.

3.2. The children distinguish between home and school contexts

The study findings reveal informal and emotional aspects of parent-child conversation in the course of the hands-on activities at home, in contrast to the formality in the relationship with the teacher in school. So the children, who daily crossed two different social contexts - home and school, have to adjust their meanings to those of the *significant others* to whom they are talking (Mead, 1967).

School and home can be two different worlds for children's learning. For example, in the work of Donaldson (1978), she differentiates between *embedded* (home) and *disembedded* (school) contexts. For the six children, the home environment is embedded in experiences that respect their own values and identities, in contrast to the general patterns of the teacher' subjugation that occur at school. Some children can experience difficulties when s/he is embedded in contexts of great emotional meanings at home, such as Mick, who is not well adjusted to the teacher who plays out in an opressive way, and sometimes he does not want to go to school after passing an uneasy night. He is timid and lacking self-confidence in the presence of the teacher, but at home he feels safe and he is a naughty boy with his brother. From the teory of Berger and Luckmann (1967) we know that: *primary socialisation takes place under circumstances which are highly charged emotionally.* Thus, the value of the home environment has to be considered as an essential part of the learning process and this can be described as the most important one for some individuals (Alexander, 1997; Silverstone, 1994; Solomon, 1994).

So learning in the context of parents helping their children with hands-on activities makes the home a place of great meaning for children.

3.3. The children want the parents to help them as *parents*

The findings support that the children want their parents to help them as *parents*, i.e the children want their parents go on being *parents* at home and not teachers. The adoption of atypical roles by the children's parents brings about irritation or anger in some children and they try to persuade their parents to break off the *teacher* role. In the informal and emotional situations of the home, the children speak more openly with their parents than with the teacher, who speaks and acts more formally with pupils in the classroom. It served to accentuate a new home situation, in which the children are much more active than in school and where they try to legitimate their identity as a family member.

The children distinguish between home and school contexts: the functions of each one must be distinct. As is the case also with Alexander's (op. cit.) view: *It would be quite wrong to 'professionalise' parenting through training, assessment and qualifications and thus increase the pressures on parents.* The author, as a lecturer in a Teacher Training College, argues that teachers as educational professionals should take account of children's different home contexts and differences between learning at home and at school. Of course, this professionalism cannot make teachers more powerful in relation to parents, but might decrease the gap between home and school learning. So the basic educational system can promote knowledge, skills and personal competence for all children, using both places of learning - home and school, as well as different roles- parent as a parent and teacher as a professional.

Thus, this research claims present a model of home as a place of learning taking opportunities for learning science into the home so that the parents can help their children to learn science without relinquishing their role as parents.

3.4. The children learn in the context of carrying out the hands-on activities with their parents' help at home

The findings show that the children learn through the hands-on activities carried out at home with their parents helping. The children's answers to the test in the classroom at the end of the school year, are on the basis of the children's learning in their homes. The child's quality of remembering in terms of explanation or description of the phenomena is related to the carrying out of hands-on activities at home with their parents' help, and this may also suggest that the children do not keep home and school knowledge totally separate. This provides some support for Vygotsky's view(1978) that the parent involvement on the child's learning must be regarded as embedded in social interactions, which underly mental processes, such as remembering.

Thus, thinking about the concept of the home culture demands that the teacher takes account of home as a place of learning in terms of cultural differences rather than cultural deficits, and should value both forms of knowledge - home and school. More work has to be done on bringing home into school and learning from parents and children.

3.5. The parents hold positive attitudes to their children's activities

The study findings show that the parental influence comes from action and does not arise from compulsion, but the parents support their children's activities, behaving in a spontaneous and enthusiastic way.

The parents in this study were aware of the importance of their contribution to the child's educational development and they considered helping their children to learn school science by doing simple experiments at home was important. The parents preferred the practical aspects of science experience at school, when they compared their education with their children's.

So the hands-on activities with everyday materials allow parents and teachers to become involved within a common framework, which is valuable to the child, in terms of creating a bridge between home and school.

Thus, decision making on the basis of partnership between schools, families and community should play an essential part in educational settings within a wider political framework in Portuguese policy, and in the research agenda of parental involvement, such as suggested by the Minister of Science and Technology, at the Ciência Viva (Science Alive) conference, in May 1999.

3.6. Each home is different in the way that the parents conduct the hands-on activities

The study findings support some kind of interdependence in the nature of knowledge acquired at home and at school via science activities because the children bring both experiences together for answering test questionnaire. Interesting evidence from the study is that the hands-on activities take place in the kitchen in general, but sometimes in the sitting-room or garden, through which the identity of each family is understood and the materials used to carry out the activities are different and peculiar to each family. This points to the importance of the social environment. The parents seem to reproduce their home culture in the hands-on activities of their children when they help their children to learn science.

From this study the relationship of the child and the parent within the home context of parents helping their children to learn science should be understood as embedded in the home culture. The child-parent interactions should develop an understanding of the different roles, strategies and attitudes that the children and their parents adopt in the course of the hands-on activities, as a special way of giving meaning to their family's home cultures.

4. Some implications of the study for the teaching/learning process

The child is a member of the two social worlds and can learn at home and at school, but the learning process is different in each situation. We find that this research study provided some relevant findings for understanding the

relationship between home and school environments, in particular home as a place of learning in the context of parents helping their children to learn science.

This study conceptualises children's educational development in terms of Vygotsky's theoretical view, which emphasises cognition as a sociocultural process. At the end of their school year, the children can remember what they learnt through the hands-on activities carried out at home with the parents helping and the quality of the children's remembering may be the result of parental influence.

The findings in this study also revealed that the children, who daily crossed between two different social contexts - home and school- learnt to adjust their meanings to those of the *significant others* to whom they are talking (Mead, 1967). For example, the children distinguished between home and school contexts and they use an informal and emotional conversation with their parents and a formal one with the teacher in the classroom. The parents enthusiastically helped their children with hands-on activities and so could make learning much easier.

The present study also reveals some relevant findings from an educational perspective in science. The children learn in the context of carrying out the hands-on activities with their parents' help at home and the parents also learn, as shown in the parents' comments of their remembered enjoyment of science at home, when they compared their education with their children's.

The *everyday* practical science, which is common feature in the life of both parents and children, can present a new aspect of science, and the results of this study implied that parental interest and supported would be accessible and valuable to the child in primary science. In fact, the parents seem to prefer the practical aspects of science to the theoretical ones and this is reflected in their comments about their own science experience at school when they compared their education with their children's.

When the school science activities enter the home and the activities have direct meaning for the family, this provides opportunities for the parents and children to share in the schools' work. The children who carried out the hands-on activities with their parents' help thought that their parents did *science* experiments at home and that they were part of daily life. However, the children who did not carry out the hands-on activities at home did not share the ideas of science as being a human activity located in everyday life. In his book *The culture of education*, Bruner (1996) argues that children show a strong *predisposition to culture* and he writes that *they are sensitive to and eager to adopt the folkways they see around them.* So the children who carried out the activities with their parents helping them are able to relate home life to science. Thus, the relationship between home and school can help to make links, connecting primary science to everyday life, and taking into account the children's home culture.

The hands-on activities were less a form of instruction, more a combined discovery. Afterwards the parents made links with other everyday phenomena, e.g. practical science (not theoretical). So the hands-on activities were a way of enhancing some kind of familiarity with science. It linked directly with other phenomena observed in nature. Thus, it is possible that if the school extended too strongly, as an institution, with its own practices into the home, it could damage the natural relations between parents and children.

The parents consider that helping their children to learn school science by doing simple experiments at home is important and they are aware of the importance of their contribution to the child's educational development.

Finally, the study findings support the diversity of cultures in the homes. This can have implications in pre- and in-service training courses for teachers' work with children and their families. So, in conjunction with my actions as a teacher educator, it seems important to include on the curriculum the understanding of the education for diversity. Teacher training courses have to do more to prepare teachers for working with children and to value their sociocultural differences. It is important to encourage forms of parental involvement, especially through a constant dialogue and an intense respect for parents, in particular, those that are from non-dominant cultural backgrounds.

Teachers as professionals should learn from studying parents and children interactions at home and use the school as a resource for supporting the home as a significant aspect of a child's learning life. More studies into parental involvement are necessary to:

(a) the bringing of home experiences into school, and
(b) the building of home as a special place of learning.

Bibliography

ALEXANDER, T. (1997) Learning begins at home: Implications for a learning society. In. COSIN, B. and HALES, M. **Families, Education and Social Differences**. London: Routledge.

BERGER, P. and LUCKMANN, T. (1967) **The social construction of reality. A treatise in the sociologie of knowledge**. London: Penguin Books.

BOURDIEU, P. and PASSERON, J-C (1977) **Reproduction in Education, Society and Culture**. London: SAGE Publications, 5.

BRUNER, J. (1996) **The Culture of Education**. Cambridge and London: Harvard Univ. Press.

CARDOSO, L. (1999) Relationship between home-background factors and children's educational development in science. Unpublished thesis. Univ. of Oxford.

DONALDSON, M. (1978) **Children's Minds**. London: Fontana Press.

SHIPS Project (1992) School Home Investigations in Primary Science. SOLOMON, J. and LEE, J. Hatfield: ASE.

SILVERSTONE, R. (1994) **Television and everyday life**. London: Routledge.

SOLOMON, J. (1994) Towards a notion of home culture: Science education in the home. **British Educational Research Journal**, 20 (5): 565-577.

VYGOTSKY, L. (1978) **Mind and Society**. Cambridge: Harvard Univ. Press.

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